

## BEHAVIORAL AND EVOLUTIONARY SIGNIFICANCE OF THE ABNORMAL GROWTH OF BEAKS OF BIRDS

By WADE FOX

Although peculiarly shaped or abnormally long beaks are not uncommon among caged birds, to my knowledge very little has been reported concerning the occurrence of such abnormalities among wild birds. The bizarre growths in captive birds are generally believed to be due to injury of the tissue that produces the rhamphotheca or to some condition that causes imbalance in the wearing processes. While it seems likely that injury may also account for the few cases of beak abnormalities among wild birds that have come to my attention, there is also the possibility that some of the latter may be due to mutation.

Bowles (Condor, 10, 1908:129-130) reported an adult female Red-breasted Sapsucker (*Sphyrapicus varius*) in which the upper jaw was two and one-half inches long and curved far over to the right. He observed this bird feeding by digging with the long upper half of the beak. It had to turn its head to one side to pick up the food. Although this bird would appear to be handicapped, Bowles stated that it fed easily and was fat and healthy.

Jack von Bloeker, Jr., and I collected an adult female Scrub Jay (*Aphelocoma coerulescens*) in the piñon-juniper association on the southeastern slope of the San Jacinto Mountains. In this bird both the upper and lower portions of the bill are unusually long (fig. 1). The upper mandible measures about 66 mm. in length and the lower about 62 mm. In life both portions of the bill were slightly twisted dextrally, although the tips approximated each other fairly closely. As the prepared specimen dried, the upper mandible curved sharply to the right, considerably separating the two tips. This bird was well fed and appeared in good health. Notes on its feeding behavior were not obtained.

Dr. Loye Miller has kindly placed at my disposal two peculiar specimens in his collection at the University of California at Los Angeles and has suggested that I place on record his observations regarding one of them.

The first, an adult California Thrasher (*Toxostoma redivivum*) was collected near Westwood Village, Los Angeles County, California. The feathers were missing from the head and neck, and it was in very poor health. The specimen has an exceptionally long, down-curved bill that turns slightly to the left toward the tip (fig. 2). The upper mandible is broken off at a length of 69 mm. The unbroken lower mandible measures 112 mm. Both of these measurements were taken along the curvature of the cutting edges of the mandibles. The bird appeared to be weak and emaciated when collected. One is inclined to assume that the bird had not been able to feed adequately with the abnormally long bill. However, it is equally possible that the starvation was due to the broken upper mandible. The break was sharp and possibly postmortem.

The last specimen which I wish to report is a male Black-headed Grosbeak (*Pheucticus melanocephalus*) collected by Loye Miller on May 30, 1926, on Mount Pinos, Kern County, California. The abnormality in this case consists of a flange of rhamphotheca on the left side of the lower mandible which extends across the side of the upper mandible. It would appear that this bird could have fed only from the right side of the beak and that it must have been considerably handicapped by this deformity. Nevertheless, the bird was in good condition and was apparently well fed. More interesting than the bird itself are the following observations made by Dr. Miller at the time of collection. He had observed one grosbeak feeding another and had assumed that this was an instance of a male feeding a female in early courtship. Upon shooting the bird

that was being fed, he was surprised to find that it was the male with the abnormal bill. There was no doubt in his mind that a female had been feeding the male. It seems probable that the well fed condition of the male and his obviously recent successful migration had been made possible by the efforts of the female. At least, in view of the male's handi-

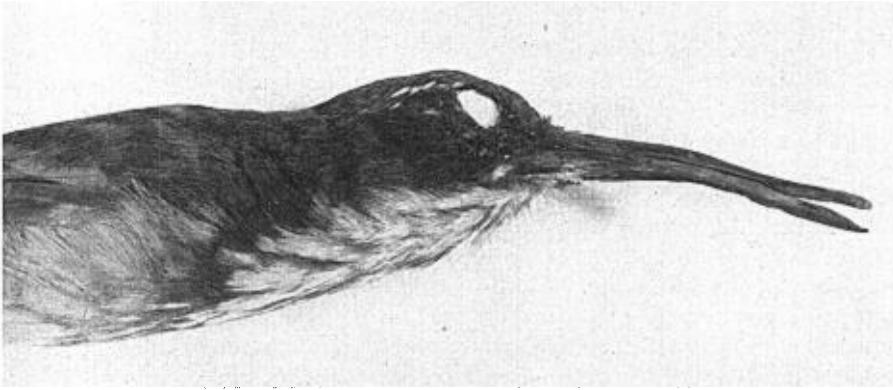


Fig. 1. Abnormal Scrub Jay from the San Jacinto Mountains, California.

capped condition and the attention shown to him by the female, the dependency of the male on the female for an extended period seems evident.

This spectacular departure from the usual behavior of Black-headed Grosbeaks suggests that there may be many more possibilities for variations of bird behavior than

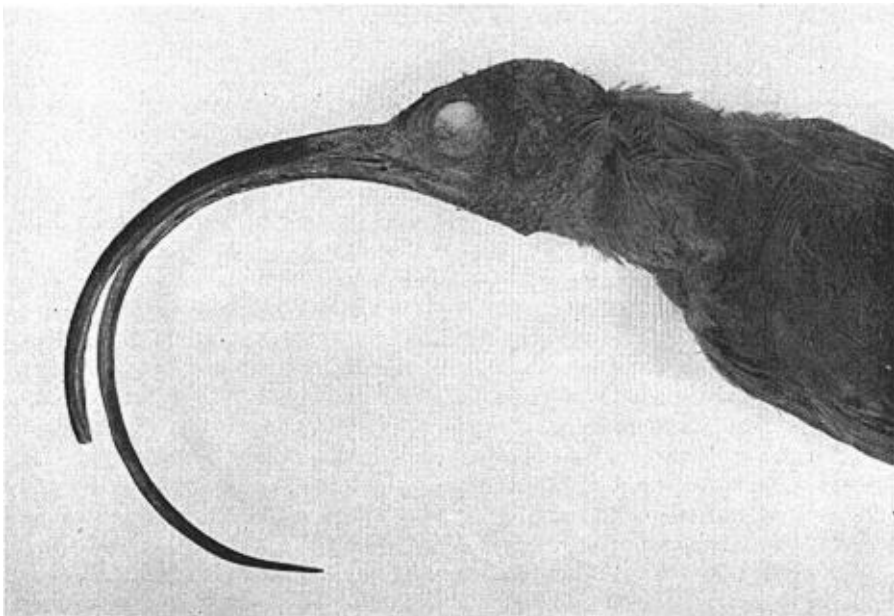


Fig. 2. Abnormal California Thrasher from Los Angeles County, California.

one might expect in view of the great emphasis placed on their stereotyped reactions. Much insight into bird behavior might be gained by studying rare abnormal individuals such as those mentioned above. Such observations give some clue as to the extent to

which set behavior patterns are adjustable to new situations. Further, they lead one to suspect that an abnormal structure may effect not only the behavior of the individual in which it occurs, but also that of other members of the species which it may encounter. I think it is important to reemphasize the value of studying these rare freaks of nature alive and in their natural habitat. Once such a specimen is collected nearly all its value is lost.

From the standpoint of evolutionary possibilities, it would be interesting if these enlarged and malformed bills could be shown to be due to variations of the germ plasm. It seems more likely, however, that as in aviary birds, they are caused by injuries to the rhamphotheca. X-ray examinations of the beaks of the three birds to which I had access revealed that the bony portions of the beaks were normal in size and shape and that the abnormal growths were confined to the dermatheca (for the X-ray photographs I am indebted to Mr. Lee Swinford of the University of Southern California Dental School). If the excessive length of the bills of the jay and thrasher was due to mutation one might expect that the bony portions of the beaks would be longer than those of normal birds; if due to injury one might expect to find scars on the bones. While the X-ray photographs were not conclusive, they lend greater support to the possibility that the growths were due to injuries since the bony structure of the bills appeared to be normal. In the case of the Scrub Jay, the eroded appearance of the dermatheca at the base of the beak lends further support to this thesis. On the other hand, the remarkably parallel growth of both the upper and lower mandibles in both the jay and thrasher suggests that the abnormality may be genetic in nature. It seems questionable that both mandibles could maintain such long, uniform and correlated growth if each portion had to be stimulated to grow by injury. While this is not impossible, it seems a very remarkable coincidence. Caged birds frequently develop unusually long bills due to lack of wear. Possibly lack of wear could account for both the excessive growth and the correlation between the two mandibles.

In itself, the occurrence of these abnormal beaks does not clearly have evolutionary significance. However, the successful survival of the individual birds possessing structures foreign to the species may have such evolutionary significance. Whether mutation or injury proves to be the cause of the abnormalities, it can not be denied that the behavior of the species in each case was sufficiently plastic to permit at least a partly successful utilization of a "new tool" for several months, possibly for more than a year.

In at least one case, the adjustable social behavior of both male and female appears to have been responsible for the survival of the malformed male; in the other cases individual adaptability of the abnormal bird seems to have been sufficient. In the face of observations such as these, one is tempted to postulate that should such a markedly different structure arise due to heritable mutations, the individual involved would have a fair chance of surviving, thus affording an opportunity for further evolution of the species. There are frequent occasions when one wonders what the chances are for the coincident occurrence of mutations resulting in the formation of a "new tool" and the simultaneous alterations of the nervous system which would render this tool useful. The survival of the abnormal birds herein described suggests that perhaps the functioning of the nervous system of the bird is more labile than we have been led to believe. Perhaps there is a very good possibility that a "new tool" could survive for several generations and thus afford an opportunity for the appearance of behavioral patterns suited to cope with a new situation.

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January 10, 1952.*